

REMARKS

This Amendment is filed in response to the Office Action dated June 15, 2005, which has a shortened statutory period set to expire September 15, 2005.

Rejections Under 35 U.S.C. 102

Claims 51 and 52 stand rejected under 35 U.S.C. 102(e) as being anticipated by Birdsley. Applicant respectfully traverses these rejections in view of the following remarks.

Claim 51 recites:

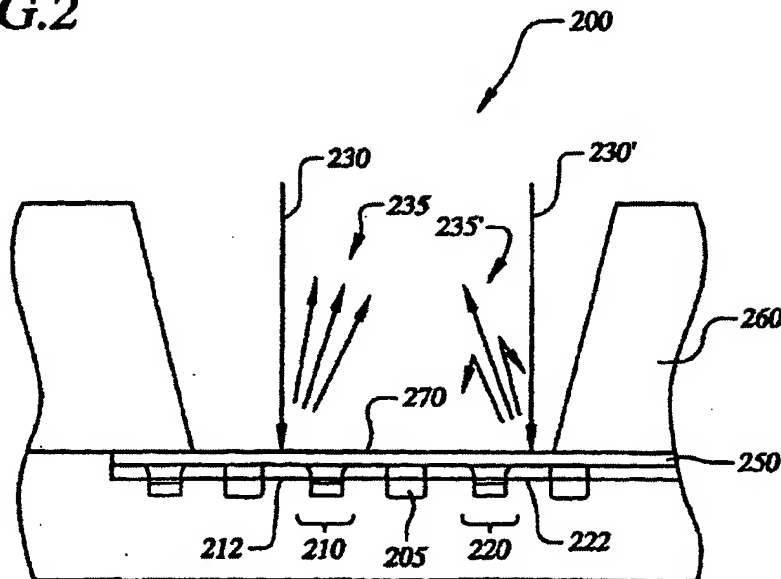
[An] energy beam ... configured to **remove a portion of the contaminant layer to expose an analysis area** on the thin film; and

a thin film analysis module for **measuring the thin film at the analysis area**, wherein the thin film analysis module comprises a contact-based electrical analysis system. (Emphasis added.)

In contrast, Birdsley teaches "a method and system for **analyzing a semiconductor die** ... to determine the static logic state of **the circuitry**." (Birdsley, col. 2, lines 13-18, emphasis added.) "[A]nalyz[ing] the underlying circuitry" (Birdsley, col. 3, lines 41-42) of a die as taught by Birdsley is fundamentally different from "measuring the thin film" as recited by Claim 51, in that electrical circuit analysis investigates circuit functionality, while thin film measurement investigates thin film characteristics (e.g., "the thickness and composition of each thin film" (specification, paragraph 2)). The two realms therefore have substantially different goals, use substantially different techniques, and have substantially different concerns. Birdsley makes no explicit reference to thin film measurement, nor does Birdsley suggest any applicability to thin film measurement.

The circuit analysis focus of Birdsley is explicitly described with respect to FIG. 2 of Birdsley (duplicated here for reference). As shown in FIG. 2, "[a] portion of silicon substrate 260 has been removed from the back side of the die 200, leaving an exposed probe surface 270 of a BOX layer 250." (Birdsley, col. 3, lines 61-63.) The Office Action indicates that BOX (buried oxide) layer 250

FIG.2



corresponds to the "thin film" recited by Claim 1. However, as explicitly stated by Birdsley, "a probing arrangement is used to induce a **response that is a function of the logic state of the underlying circuit regions** in the die." (Birdsley, col. 4, lines 16-18, emphasis added.) BOX layer 250 merely "acts as a dielectric and facilitates capacitive coupling between the probe region and the source/drain region." (Birdsley, col. 4, lines 28-30, emphasis added.) Thus, "measuring the thin film at the analysis area" as recited in Claim 1 is neither disclosed nor suggested by Birdsley.

Furthermore, Birdsley does not teach "a contact-based electrical analysis system" as recited by Claim 51. Birdsley describes "electron beam probing ... [in which] **an electron beam 230 is directed at a portion of the probe surface.**" (Birdsley, col. 4, lines 20-23, emphasis added.) No contact-based apparatus or technique is disclosed or suggested by Birdsley.

Thus, for at least these reasons, Claim 51 is allowable under 35 U.S.C. 102(b) over Birdsley. Accordingly, Applicant respectfully requests reconsideration and allowance of Claim 51.

Claim 52 recites in part:

[D]irecting an energy beam at a first location on the contaminant layer while the test sample is on the stage, **the energy beam removing a first portion of the contaminant layer to expose a first analysis area of the thin film; and measuring the thin film at the first analysis area** while the test sample is on the stage, wherein measuring the thin film comprises **performing a contact-based electrical analysis.** (Emphasis added.)

Thus, for reasons substantially similar to those described above with respect to Claim 51, Claim 52 is allowable under 35 U.S.C. 102(b) over Birdsley.

Accordingly, Applicant respectfully requests reconsideration and allowance of Claim 52.

Rejections Under 35 U.S.C. 103

Claims 1, 8, 14, 17, 18, 19, 20, 21, 24, 27, 33, 35, 36, 37, 41, 44, and 47 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Elliot in view of Fukuda. Applicant respectfully traverses these rejections in view of the foregoing amendments to the claims and the following remarks.

Claim 1, as amended, recites in part:

[A]n energy beam source for directing an energy beam at the contaminant layer during a cleaning operation, **the energy beam being configured to create an opening in the contaminant layer; and**

a thin film analysis module for **performing** at least one of single wavelength ellipsometry (SWE), spectroscopic ellipsometry (SE), reflectometry, grazing incidence x-ray reflectometry (GXR), x-ray fluorescence (XRF), electron microprobe analysis (EMP), non-contact-based electrical analysis, and contact-based electrical **analysis on the thin film through the opening in the contaminant layer.**

(Emphasis added.)

Support for this amendment is found in the specification as originally filed at least at paragraphs 29, 30, 32, and in FIG. 3b. Claims depending from Claim 1 are amended as necessary to maintain consistency with amended Claim 1. No new matter is added. Using "an energy beam ... to create an opening in the contaminant layer" as recited by Claim 1 beneficially "minimizes any impact on analysis throughput ... [while t]he potential for damage to the underlying thin film layer 312 and/or substrate 311 is minimal because only a small portion of test sample 310 is heated." (Specification as originally filed, paragraph 30.)

In contrast, Elliott teaches a technique in which "the **entire surface** of the substrate [is] passed beneath the illumination zone 468" (Elliott, col. 22, lines 26-27, emphasis added). Elliott describes a system in which "the beam and the substrate are moved relative to one another to cause the beam to **sweep the surface.**" (Elliott, abstract, emphasis added.) For

example, FIG. 10B of Elliott (duplicated here for reference), depicts that "it is useful to perform two sets of **scans** with the angled beam, the laser optics or the wafer [being] rotated 90 degrees to **produce first 239 and second 241 transverse sets of scans.**" (Elliott, col. 15, lines 19-22, emphasis added.)

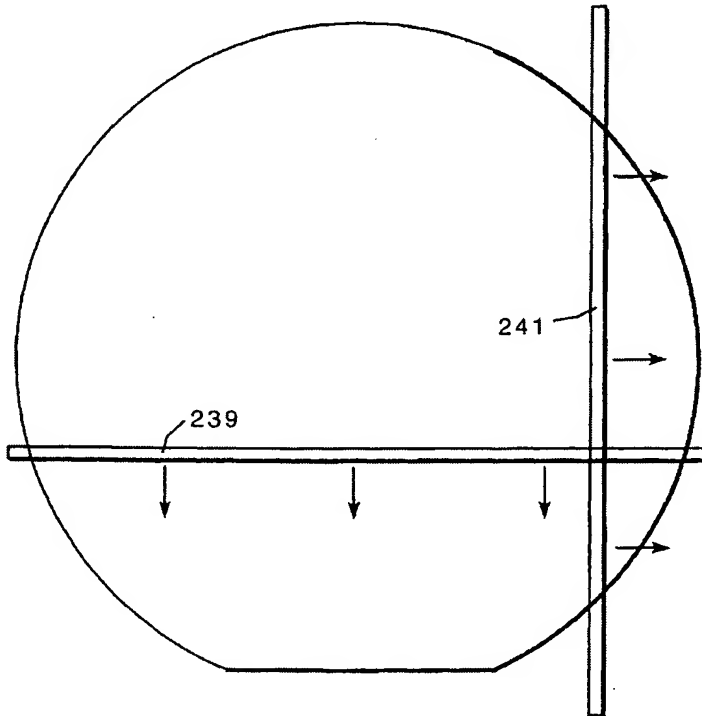


FIG. 10B

Thus, Elliott is directed solely towards a bulk (total wafer) cleaning methodology, and therefore teaches away from an "energy beam being configured to create an opening in the contaminant layer" as recited by Claim 1. The scanning methodology of Elliott consequently cannot "create an opening in the contaminant layer" as recited by Claim 1. Therefore, Elliott cannot teach "directing a probe beam through the opening at a first analysis area on the thin film" as further recited by Claim 1. Fukuda describes a technique in which "the Si/O atomic ratio in the deposited film [is] measured through Auger electron spectroscopy" (Fukuda, col. 11, lines 46-47), but does not remedy the above-described deficiencies of Elliott.

Thus, for at least these reasons, Claim 1 is allowable under 35 U.S.C. 103(a) over Elliott in view of Fukuda. Claims 8, 14, 17, 18, 19, 20, 21, and 24 depend from Claim 1, and are therefore allowable over Elliott in view of Fukuda for at least the same reasons that Claim 1 is allowable. Accordingly, Applicant respectfully requests reconsideration and allowance of Claims 1, 8, 14, 17, 18, 19, 20, 21, and 24.

Claim 27, as amended, recites in part:

[D]irecting an energy beam at a first location on the contaminant layer while the test sample is on the stage, the energy beam removing a first portion of the contaminant layer to create an opening in the contaminant layer to expose a first analysis area of the thin film; and performing at least one of single wavelength ellipsometry (SWE), spectroscopic ellipsometry (SE), reflectometry, grazing incidence x-ray reflectometry (GXR), x-ray fluorescence (XRF), electron microprobe analysis (EMP), non-contact-based electrical analysis, and contact-based electrical analysis on the thin film at the first analysis area through the opening in the contaminant layer while the test sample is on the stage. (Emphasis added.)

Support for this amendment is found in the specification as originally filed at least at paragraphs 29, 30, 32, and in FIG.

3b. Claims depending from Claim 27 are amended as necessary to maintain consistency with amended Claim 27. No new matter is added.

For reasons substantially similar to those presented above with respect to Claim 1, Claim 27 is allowable under 35 U.S.C. 103(a) over Elliott in view of Fukuda. Claims 33, 35, 36, and 37 depend from Claim 27, and are therefore allowable over Elliott in view of Fukuda for at least the same reasons that Claim 27 is allowable. Accordingly, Applicant respectfully requests reconsideration and allowance of Claims 27, 33, 35, 36, and 37.

Claim 41, as amended, recites in part:

means for directing an energy beam at the contaminant layer during a cleaning operation, **the energy beam removing a portion of the contaminant layer to create an opening in the contaminant layer to expose an analysis area on the thin film;** and

means for **performing** at least one of single wavelength ellipsometry (SWE), spectroscopic ellipsometry (SE), reflectometry, grazing incidence x-ray reflectometry (GXR), x-ray fluorescence (XRF), electron microprobe analysis (EMP), non-contact-based electrical analysis, and contact-based electrical **analysis on the thin film at the analysis area through the opening in the contaminant layer.**
(Emphasis added.)

Support for this amendment is found in the specification as originally filed at least at paragraphs 29, 30, 32, and in FIG. 3b. Claims depending from Claim 41 are amended as necessary to maintain consistency with amended Claim 41. No new matter is added.

For reasons substantially similar to those presented above with respect to Claim 1, Claim 41 is allowable under 35 U.S.C. 103(a) over Elliott in view of Fukuda. Claims 44 and 47 depend from Claim 41, and are therefore allowable over Elliott in view of Fukuda for at least the same reasons that Claim 41 is

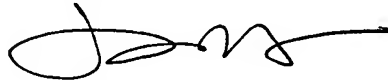
allowable. Accordingly, Applicant respectfully requests reconsideration and allowance of Claims 41, 44, and 47.

CONCLUSION

Claims 1, 8, 14, 17, 18, 19, 20, 21, 24, 27, 33, 35, 36, 37, 41, 44, and 47 are pending in the present Application. Reconsideration and allowance of these claims is respectfully requested.

If there are any questions, please telephone the undersigned at (408) 451-5903 to expedite prosecution of this case.

Respectfully submitted,




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I hereby certify that this correspondence is being deposited with the United States Postal Service as FIRST CLASS MAIL in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on September 15, 2005.

9/15/2005

Date


Signature: Rebecca A. Baumann